

					Resource Action Information											
Preliminary: For Environmental Work Group Discussion Only					Temperature Related	Flow/Water Level Related	Construction/Heavy Equipment	O&M	Permitting	Cross-Resource/Area Effect	Nexus to the Project Operations (see note)	Need Additional Info	Information Pending [Studies Being Conducted]	Comments and Additional Information	Technical Contacts/ Resource Team	Date for Narrative Report
Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
Aquatic Resources - Provide for Upstream Passage of Anadromous Fish																
EWG-1	Low Flow Channel	Fish Holding and Spawning Habitat	Adult Chinook Salmon Holding Habitat and Spatial Separation of Spawning Spring-Run Chinook Salmon and Fall-Run Chinook Salmon	Open Fish Barrier Pool to fish passage and allow the pool to be used as a spring Chinook salmon holding. Requires the addition of a fish ladder to the Fish Barrier Dam and modifying the existing ladder with a branch to the Fish Barrier Pool. (FR-1)		X	X	X	X			X	SP-F3.1 SP-F10 Task 1E	Information is needed on feasibility of utilizing existing holding habitat for spring-run Chinook salmon in Fish Barrier Pool (March-June). This information is expected from SP-F10 Task 1E. If habitat exists, need conceptual design and costs.	TBD	23-Jul-03
EWG-2A	Low Flow Channel	Upstream Fish Passage and Holding and Spawning Habitat	Adult Chinook Salmon Upstream Passage and Spatial Separation of Spring-Run Chinook Salmon and Fall-Run Chinook Salmon	Install a weir at lower end of low flow section (from July 1st to November 15th) to selectively pass desired fish species into the low flow channel. Currently, fishes in the Feather River are allowed free access into the upper portions of the low flow channel. This Resource Action would address concerns about high salmonid spawning densities in the low flow channel and provide an opportunity to segregate the spring and fall runs of Chinook salmon in the Feather River. (FR-2)			X	X	X	X		X	The following plans may help the site selection: location and quality of spawning habitat: SP-F10 Task 2A, 2B, 2C Location and quality of holding habitat: SP-F10 Task 1E	Related to EWG-34 & EWG-41. EWG-1 and EWG-2B provide different mechanisms for achieving a similar resource goal. Need to identify suitable location and develop conceptual design. SP-F10 Task 1E will provide information regarding locations where spring-run Chinook salmon currently hold, which is information that would be required to identify a suitable location for the weir. This action would require a method for collecting adult fall-run Chinook salmon for the Feather River Fish Hatchery broodstock collection. This Resource Action could also effect boating. Provides additional benefit of providing a constriction point for immigration and/or emigration monitoring activities. Also reduces superimposition on spring-run Chinook salmon by fall-run Chinook salmon.	TBD	23-Jul-03
EWG-2B	Low Flow Channel	Fish Holding and Spawning Habitat	Adult Chinook Salmon Holding Habitat and Spatial Separation of Spring-Run Chinook Salmon and Fall-Run Chinook Salmon	Install a size exclusion device such as a lattice grating near Bedrock Park from July 1st to November 15th in order to provide spatial separation of holding and spawning habitat for spring-run and fall-run Chinook salmon. The latticed grate would be designed to block movement of adult salmonids but not juveniles. (FR-2)			X	X		X		X	The following plans may help the site selection: location and quality of spawning habitat: SP-F10 Task 2A, 2B, 2C Location and quality of holding habitat: SP-F10 Task 1E	EWG-1 and EWG-2A provide different mechanisms for achieving a similar resource goal. Need to identify a suitable location and develop a conceptual design. SP-F10 Task 1E will provide information regarding locations where spring-run Chinook salmon currently hold, which is required to identify a suitable location for the size-exclusion device. This Resource Action would require a method for collecting adult fall-run Chinook salmon for the Feather River Fish Hatchery broodstock collection, which could potentially include a nature-like fishway which may also double as rearing habitat for salmonids. This Resource Action could also effect boating. This Resource Action would reduce superimposition of spring-run Chinook salmon redds by later-spawning fall-run Chinook salmon.	TBD	23-Jul-03
EWG-3 (To be merged with EWG-88)	Low Flow Channel	Impaired Fish Passage	Adult Sturgeon Upstream Passage	This Resource Action would increase flows during critical upstream passage periods for sturgeon at Steep Riffle. Currently, flows in the low flow reach are maintained at 600 cfs, except during flood events or occasional temporary changes in project operations.		X			X	X		X	SP-F3.2 Task 3A; UCD study on sturgeon swimming performance	Potential cross-resource impact on riparian vegetation and fluvial processes, depending on the magnitude of flow alterations. Timing of sturgeon upstream migration is February-June. SP-F3.2 Task 3A assessment concluded that green sturgeon could likely ascend steep riffle without complication—therefore, no need is currently identified for this PM&E.: March-June (spring-run Chinook salmon), September-December (fall-run Chinook salmon), September-January (steelhead), SP-F10 Task 1C determined that under current operating parameters flow related physical passage impediments to adult salmonid upmigration are not apparent and May June (shad).	TBD	TBD
EWG-88 (To be merged with EWG-3)	Low Flow Channel	Fish Spawning Habitat Enhancement	Spawning Gravel Quantity	Increase flows in the low-flow reach of the Feather River reach to increase available spawning habitat. This Resource Action would increase flows above current levels (600 cfs) during peak Chinook spawning to increase the quantity of habitat available for salmonids. (FR-51)	X	X		X	X	X		X	SP-F16 SP-G2	This Resource Action would need to keep flows up during periods of fish spawning so as to not dewater redds. Ongoing field analysis associated with SP-G2 will provide additional data. Would likely be combined with Resource Action as EWG-15. SP-F16 will determine the flow range at which weighted usable area (WUA) is greatest.	TBD	TBD

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Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
EWG-4A	High Flow Channel	Upstream Fish Passage	Provide Attraction Flows for Adult Upstream Migration	Provide pulse flows from the Thermalito Afterbay Outlet or the Thermalito Diversion Dam to the high flow section of the Feather River to facilitate upstream migration of adult sturgeon (February-June) and shad (May-June) to potentially reduce holding time below Shanghai Bench and Sunset Pumps. Under this Resource Action, the same acre-footage of water would be released over the upstream migration time period, but the regime would be altered so that the flow pattern would include pulses that would not have previously existed.		X		X		X		X	SP-F3.2 Task 3A; SP-F3.2 Task 5; UCD study on sturgeon swimming performance	Additional information needed regarding the magnitude of the flow pulse desired (i.e. 2X base flow) and the frequency and duration with which the pulse desired (i.e. one week per month, one day per week, etc.). Providing pulse flows at these times could also benefit rearing salmonids, as well as spawning and rearing splittail, by providing inundated floodplain habitat (see EWG-19A). Providing pulse flows may also benefit upstream passage of adult American shad and sturgeon (see EWG-4B). Facilitating Passage over Shanghai Bench using flow would require coordination with Yuba River operations. Pulse flows during this time period may result in redd dewatering or juvenile fish stranding for Chinook salmon and steelhead. Potential cross-resource effect on riparian vegetation and fluvial processes, depending on the magnitude of flow alteration. (Includes concepts previously embedded in EWG-9.)	TBD	TBD
EWG-4B	High Flow Channel	Attraction Flows	Attraction Flows for Adult Upstream Migration, Primarily for Splittail, American Shad, and Sturgeon, and Secondarily for Spring-run Chinook Salmon and Steelhead	Provide high flow pulses in winter-spring (Feb-May) that will serve as attraction flows primarily for shad (May-June), sturgeon (February-June), and splittail (January-April). Secondarily, pulse flows would serve as attraction flows for spring-run Chinook salmon and steelhead. (FR-15) (FR-29)		X		X	X	X		X	SP-F3.2 Task 3A, SP-F10 Task 1A, SP-F10 Task 1C	Flow could originate from the Thermalito Afterbay Outlet or the Thermalito Diversion Dam. Additional information needed regarding the magnitude of the flow pulse desired (i.e. 2X base flow) and the frequency and duration with which the pulse desired (i.e. one week per month, one day per week, etc.). Providing pulse flows at these times could also benefit rearing salmonids, as well as spawning and rearing splittail, by providing inundated floodplain habitat (see EWG-19A). Providing pulse flows may also benefit upstream passage of adult American shad and sturgeon (see EWG-4A). Releases for attraction flows would require coordination with Yuba River operations. Need additional information on attraction and pulse flows. Potential cross-resource effect on riparian vegetation and fluvial processes, depending on the magnitude of flow alterations. Redds constructed in shallow water during pulse flows may result in dewatering or juvenile fish stranding (Chinook salmon and steelhead).	David Olson, Chuck Hanson, Paul Bratovich	23-Jul-03
EWG-5	High Flow Channel	Upstream Fish Passage	Upstream Passage for Adult Sturgeon and Shad	Under low flow conditions, Shanghai Bench and Sunset Pumps may be impassable for sturgeon and/or American shad due to high water velocities in some areas and/or a vertical height barrier. Structurally modify the Sunset Pumps and/or Shanghai Bench areas to aid passage of sturgeon, and shad. This Resource Action would provide physical changes to these areas to aid anadromous fish passage. (FR-16, FR-17) Options for physical changes include: - Blast a section of Shanghai Bench to turn it into a chute. - Add a ladder at Shanghai Bench. - Add a ladder at Sunset Pumps. - Change channel configuration to increase the depth and proportion of flow in the existing side channel. - Change channel configuration to create a low velocity side channel at Sunset Pumps.			X	X	X	X		X	Upstream passage: Sturgeon: F3.2 - Task 3A Shad: SP-F3.2 Task 5 UCD swimming performance study	Need velocity information under different low flow conditions. Combines related Resource Actions related to Sunset Pumps from February 19 and March 26, 2003 EWG meetings.	TBD	TBD

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Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
EWG-97	Lake Oroville	Upstream Fish Passage	Adult Spring-Run Chinook Upstream Passage	Provide upstream passage of anadromous fish (e.g., spring-run Chinook) through trap and transport program. [Passage would be to locations upstream of Oroville Dam including the upstream tributaries.]			X	X	X	X		X	SP-F15	This Resource Action incorporates NOAA Fisheries re-introduction of spring-run Chinook to the upstream tributaries of Lake Oroville. SP-F15 will provide an analysis of the feasibility of providing passage for anadromous fish upstream of Lake Oroville using a wide variety of fish passage mechanisms/programs. There is also a concern related to potential fish disease, predation, genetic introgression, and potential competition for food and habitat with resident fish.	David Olson, Phil Unger, Eric See, MaryLou Keefe, Eric Theiss	23-Jul-03
Aquatic Resources - Provide for Passage of Resident Fish																
EWG-10A	Upstream Tributaries	Impaired Fish Passage	Upstream Passage of Lake Oroville’s Resident Fish	Provide resident fish with access to the upstream tributaries by removing sediment plugs which block asses to the upstream tributaries of Lake Oroville.		X	X	X	X	X		X	- Characterization of existing upstream migration barriers: SP-F3.1 Task 1A - Fish species composition in upstream tributaries: SP-F3.1 Task 1B - Fish species composition in Lake Oroville: SP-F3.1 Task 2A - Interactions between reservoir fish and tributary fish: SP-F5/7 Task 3 - Characterize the sediment wedges: SP-G1 - Task 2	This Resource Action would likely increase the quantity and quality of available salmonid spawning habitat. Combines similar Resource Actions (EWG-10B) by removing upstream barriers. Related to EWG-96. Evaluation of introducing fish in Lake Oroville to areas that they have not had access to should include consideration of: predation, disease transmission, genetic introgression, and competition for food and habitat.	TBD	23-Jul-03
EWG-10B	Upstream Tributaries	Impaired Fish Passage	Upstream Passage of Lake Oroville’s Resident Fish	Provide resident fish with access to the upstream tributaries by removing boulders and manmade barriers. This Resource Action could include the removal of Big Bend Dam or the construction/repair of fish passage facilities at this site to open up the Poe Reach. (LO-5, LO-6, LO-7)		X	X	X	X	X		X	-Characterization of existing upstream migration barriers: SP-F3.1 Task 1A -Fish species composition in upstream tributaries: SP-F3.1 Task 1B -Fish species composition in Lake Oroville: SP-F3.1 Task 2A -Interactions between reservoir fish and tributary fish: SP-F5/7 Task 3 - Characterize the sediment wedges: SP-G1 - Task 2	Combines similar Resource Actions (EWG-10A) by removing upstream barriers. This Resource Action would also likely increase the quantity and quality of available salmonid spawning habitat. Evaluation of introducing fish in Lake Oroville to areas that they have not had access to should include consideration of: predation, disease transmission, genetic introgression, and competition for food and habitat. This Resource Action may result in impacts to the recreational fishery in Lake Oroville if fish which were previously unable to pass into the upstream tributaries are now capable of migrating into the tributaries. Management goals in existing fisheries in upstream tributaries may conflict with the idea of introduction of Lake Oroville fish species into upstream tributaries. For example, the Poe reach is trying to manage for a trout fishery and it may be contradictory to their management goals to introduce bass species from Lake Oroville into the upstream tributaries.	TBD	TBD
Aquatic Resources - Limit Downstream Passage of Hatchery Produced Trout to Minimize Potential Effects on Natural Steelhead Reproduction																

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Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
EWG-11	High Flow Channel	Interaction of Stocked Fish with ESA-listed Fish Species	Passage of Stocked Rainbow Trout from the Thermalito Complex Into Feather River	Prevent downstream passage of rainbow trout from the Thermalito Complex into the Feather River. Currently rainbow trout are stocked in the Thermalito Forebay for a "put and take" fishery. This Resource Action will address concerns about hatchery-origin trout interacting with natural steelhead in the Feather River. (TC-1) Opportunities to prevent downstream passage of rainbow trout include changing the species that are stocked in the Forebay (i.e. stock steelhead, Chinook salmon, coho salmon, or brown trout instead of rainbow trout) or eliminating stocking in the Forebay.			X	X	X	X		X	Interactions between reservoir fish and tributary fish: SP-F5/7 Task 3	Obtain information from snorkel surveys to assess impact level. Need to define specific concerns related to genetic introgression and disease transmission. Ceratomyxa may eliminate most planted trout within several weeks. Current level of trout passage into the Feather River from Thermalito Afterbay Outlet or the Thermalito Diversion Dam is undetermined. One way to determine the number of trout passing through the Thermalito Afterbay Outlet to the Feather River is to install a fish counting and identification device at the Thermalito Afterbay Outlet and Diversion Dam.	TBD	TBD
Aquatic Resources - Improve Habitat for Anadromous and Resident Fish																
EWG-13A	Low Flow Channel	Fish Rearing Habitat Enhancement	Woody Debris Recruitment for Juvenile Fish Rearing Habitat	Add woody debris in the Feather River. Large woody debris would be anchored or inserted into the river at target locations to provide increased habitat complexity. Source areas for woody debris are upstream of Lake Oroville (FR-4, FR-23)			X	X	X	X		X	Characterize current instream woody debris quantity and distribution: SP-F3.2 Task 4 Estimate woody debris input to Lake Oroville: SP-G1 Task 1.	Related to EWG-20. Additional information on the viability and sustainability of LWD placement in the Feather River flow regime and identification of candidate sites is required. Analysis of geomorphic effect of woody debris placement would be needed. Richard Harris (MWH) will provide a summary of his site visit to the low flow channel with respect to opportunity to augment LWD in the LFC. This Resource Action needs to be further developed.	TBD	TBD
EWG-13B	Low Flow Channel	Fish Rearing Habitat Enhancement	Habitat Complexity for Rearing Juvenile Steelhead and Chinook Salmon	Provide additional salmonid rearing habitat within the existing main channel of the LFC by creating additional cover, edge, and flow complexity. This could be accomplished through the addition of LWD, boulders, and other objects, and by the creation of mid-channel gravel islands. The goal of these main channel enhancements would be to provide in-stream cover, but also to increase the area of shallow-edge habitats within existing riffles and glides. The primary target for this Resource Action would be rearing steelhead and a secondary target would be rearing Chinook salmon. (FR-4, FR-23)			X	X	X	X		X	Characterize instream woody debris quantity and distribution and cover distribution: SP-F3.2 Task 4	Related to EWG-13. Need to be further developed. Additional habitat complexity may result for creation of additional side-channel habitat as identified in EWG-16. Cover enhancement in pools should generally be avoided because these are more likely to benefit predatory fishes than rearing salmonids. Fluvial 12 Model could be used to assess channel and habitat improvement stability.	TBD	TBD
EWG-14	Low Flow Channel	Fish Holding Habitat	Holding Habitat for Adult Spring-Run Chinook Salmon	Create deep pools in low-flow reach of Feather River to provide holding habitat for spring-run Chinook salmon. Deep pools would be created in reaches where water temperatures are expected to be cool enough to provide summer habitat for spring-run Chinook salmon. (FR-5)	X		X	X	X	X		X	Spring-run Chinook salmon holding habitat: SP-F10 Task 1E. Channel geomorphology from SP-G2 Task 2.	SP-F10 Task 1E indicates that potential holding pools are of adequate depth. PM&E may impact water quality. Ongoing studies to determine when and where spring-run Chinook over-summer in the low flow channel. Fluvial 12 model would be useful for site selection and analysis of stability of pools.	TBD	TBD

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EWG-15A (formerly EWG-15)	Low Flow Channel	Fish Spawning Habitat Enhancement	Spawning Habitat for Chinook Salmon	Incrementally increase flows in the low flow channel from relatively low flows (for example, 400-600 cfs or 600-800 cfs) to relatively high flows (for example, 800-1000 cfs or 1000-1200 cfs) throughout the Chinook salmon spawning season (for example, Sept 1 - Dec 1 or Sept 1 - Dec 15) in order change the lateral spawning habitat distribution from center of river channel during the early portion of the spawning season to margins of river channel in the later portion of the spawning season. Flows would be increased by some relatively consistent interval each week (for example, 25, 50, or 75 cfs/week) in order to increase usable spawning habitat and reduce superimposition of Chinook salmon redds. Once flows reach the high flow target, the high flow target would be maintained through May 30 in order to avoid dewatering steelhead redds through the incubation period.		X			X	X		X	SP-G2 WUA: For spawning Chinook salmon: SP-F16 Redd superimposition: SP-F10 Task 2B	Needs additional information regarding the target flow range in which this action would occur and the duration of the flow increases. Also see IFIM study. SP-F16 may be able to provide an assessment of the benefit associated with this PM&E by evaluating lateral redd distribution in response to flow changes.	David Olson, Ted Sommer, Tom Payne, Chuck Hanson	23-Jul-03
EWG-15B	Low Flow Channel	Fish Spawning Habitat Enhancement	Spawning Habitat for Spring-Run Chinook Salmon	Provide relatively low flows (for example, 400-800 cfs) in the low flow channel from the beginning of Chinook salmon spawning season (for example, Sept 1 - October 7 or September 1 - October 15) until spring-run Chinook salmon are believed to have spawned and then change flows to a relatively high flow (for example, 800-1200 cfs from October 8 - Dec 1 or October 16 - Dec 15) in order change the lateral spawning habitat distribution from center of river channel during the early portion of the spawning season to margins of river channel in the later portion of the spawning season. Flows would be increased once during the season in order to increase usable spawning habitat and reduce superimposition of spring-run Chinook salmon redds. Once flows reach the high flow target, the high flow target would be maintained through May 30 in order to avoid dewatering steelhead redds through the incubation period.		X			X	X		X	SP-G2 WUA: For spawning Chinook salmon: SP-F16 Redd superimposition: SP-F10 Task 2B	See above for further detail.	David Olson, Ted Sommer, Tom Payne, Chuck Hanson	23-Jul-03
EWG-16A	Low Flow Channel	Fish Rearing Habitat Enhancement	Rearing Habitat for Juvenile Salmonid Fish Species	Create side-channel habitat adjacent to the low-flow reach in the Feather River. DWR studies have found that juvenile steelhead trout strongly select shallow riffle/glide and near-shore habitats with abundant riparian and in-stream cover. Habitats meeting these criteria are most often found in side-channels. Currently preferred habitats of juvenile steelhead are not common in the LFC. To expand availability of preferred rearing habitat, side channels should be constructed at various suitable areas within the LFC. Potential sites for side channel creation in the LFC include (from upstream to downstream): Aleck Riffle, Great Western Riffle, Robinson Riffle/Borrow Pond, Steep Riffle, between Eye and Gateway Riffles, and the Oroville Wildlife Area southeast of the Thermalito Outlet. (FR-7, FR-8, FR-33)		X	X	X	X	X		X	SP-F16; SP-G2	The increased habitat complexity will benefit protected, sensitive, or other desired juvenile fish species. Side channel creation will be most effective if conducted in combination with base flow increase, planting of riparian vegetation, and re-establishment of flow through historic river channels. Needs further analysis on how side-channel habitat will be created. Ongoing studies associated with SP-G2 will provide data. Fluvial 12 model would be used to select sites and assess stability. Could be combined with EWG-21. Detailed site evaluations will be necessary to determine which site are most amenable to side channel creation or enhancement. DWR staff will provide information on specific sties.	Phil Unger, Jason Kindopp, Tom Payne, Brad Cavallo, David Olson, Rich Dehaven	25-Jun-03
EWG-91 (Moved from Fluvial Processes Section)	Low Flow Channel	Fish Spawning Habitat Enhancement	Spawning Gravel Quantity Enhancement for Adult Salmonids	Supplement the low-flow reach with suitable spawning gravel to increase productivity (i.e., # fish produced per unit area). (FR-50)			X	X	X	X		X	SP-F10.2A-gravel quality and armoring SP-G2	This Resource Action would likely be combined with EWG-16A. This option likely would require continued gravel supplementation over time. Gravel could be obtained from OWA. Ongoing field analysis associated with SP-G2 will provide additional data. Related to EWG 92.	TBD	23-Jul-03

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EWG-16B	Low Flow Channel	Fish Rearing Habitat Enhancement	Rearing Habitat for Juvenile Salmonid Fish Species	Restore and/or improve side-channel habitat adjacent to the low-flow reach in the Feather River. The two existing side channels at the upstream end of the LFC, Hatchery Ditch and Moe's Ditch, would benefit from habitat and flow enhancements. Hatchery Ditch, a primary steelhead spawning and rearing reach, is currently fed solely by seepage from the Feathery River Hatchery (FRH) settling pond. Discharge in Hatchery Ditch is directly related to water use in the hatchery. Hatchery Ditch requires its own water source so that it can function independently. This need is particularly pressing since the FRH water system is overdue for a major overhaul, which requires shutting down the hatchery water supply for several months. Moe's Ditch is a man-made spawning channel adjacent to Hatchery Ditch. Currently Moe's Ditch suffers from a lack of flow (due to upstream changes in bed morphology) and a lack of cover and channel sinuosity. (FR-7, FR-8, FR-33)		X	X	X	X	X		X	SP-F16; SP-G2	The increased habitat complexity will benefit protected, sensitive, or other desired juvenile fish species. Detailed site evaluations will be necessary to determine which sites are most amenable to side channel creation or enhancement. Needs further analysis on how side-channel habitat will be restored. Ongoing studies associated with SP-G2 will provide data. Fluvial 12 model would be used to select sites and assess stability. Could be combined with EWG-21. DWR staff will provide information on specific sties.	Phil Unger, Jason Kindopp, Tom Payne, Brad Cavallo, David Olson, Mike Melanson	25-Jun-03
EWG-92 (Moved from Fluvial Processes Section)	Low Flow Channel	Fish Spawning Habitat Enhancement	Spawning Gravel Quantity Enhancement for Adult Salmonids	Gravel replacement on the lower reach spawning riffles if these areas are found to be of poor spawning quality (ongoing, SP-G2). (FR-55)			X	X	X	X		X	SP-F10.2A-gravel quality and armoring SP-G2	This Resource Action would likely be combined with EWG-16B. Ongoing field analysis associated with SP-G2 will provide additional data. Related to EWG-91.	TBD	23-Jul-03
EWG-17	Low Flow Channel	Fish Rearing Habitat Enhancement	Rearing Habitat for Juvenile Fish Species	Enhance riparian vegetation (including trees) along banks for shading and increased habitat complexity. This could include the use of cottonwoods or alders. (FR-9)				X	X	X		X	Identify and Characterize fish habitat: SP-F3.2 Task 4 Influence of cover on habitat suitability: SP-F16	One location for vegetation enhancement could be ‘trailer park riffle’ along east side, although drawback is that high-water events may require continued maintenance/improvement of this area. Need to evaluate potential site locations. Additional considerations include that if channels become completely tree-lined, increases in flow may actually cause a decrease in the amount of shallow water habitat available. Use Fluvial 12 model to assess future erosion and channel stability.	TBD	TBD
EWG-18	Low Flow Channel	Fish Spawning Habitat Enhancement	Spawning Habitat for Chinook Salmon and Steelhead	In areas where armoring has occurred, selected sections of the low-flow reach of the Feather River would be ripped with the goal of improving spawning gravel quality. (FR-10)			X	X	X	X		X	Spawning gravel quality and armoring - SP-F10 Task 2A SP-G2	Areas suitable for ripping are uncertain at this time; further information will be obtained after results from SP-F10 Task 2A have been issued. Ripping may result in turbid water and therefore, may impact water quality. Use Fluvial 12 Model to assess effect on future grain size distribution. Closely related to EWG-90.	TBD	23-Jul-03
EWG-90 (This will be combined with EWG-18)	Low Flow Channel	Fish Spawning Habitat Enhancement	Spawning Gravel Quantity	Rip sections of the low-flow reach to improve spawning gravel composition for Chinook salmon and steelhead. This Resource Action is not specific to location at this time; results from ongoing geomorphology studies (SP-G2) will be used to better define ripping and target locations in the low-flow reach. (FR-53)			X	X	X	X		X	SP-F10.2A-gravel quality and armoring SP-G2	Ongoing field analysis associated with SP-G2 will provide additional data. May impact water quality in the Feather River. Closely related to EWG-18.	TBD	23-Jul-03
EWG-19A (formerly EWG-19)	High Flow Channel	Spawning Habitat and Rearing Habitat Enhancement	Splittail Spawning Habitat and Juvenile Chinook Salmon Rearing Habitat	Modify existing or build vegetated "benches" at various stage elevations in the lower Feather River (i.e. near Verona) to enhance splittail spawning habitat and Chinook salmon rearing habitat. (FR 22)		X	X	X	X	X		X	SP-F3.2 Task 3B SP-G2 Hydrologic Transect Data	Similar to EWG-22. Benches that provide inundated vegetation would provide suitable habitat for splittail spawning and provide valuable rearing habitat for Chinook salmon. Need additional information from SP-F3.2 Task 3B including the location and stage that would be required to inundate the constructed benches. Benches should be constructed so that they do not become potential stranding locations for juvenile salmonids.	TBD	23-Jul-03

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EWG-19B (formerly EWG-19A)	High Flow Channel	Fish Spawning Habitat Enhancement	Spawning Habitat for Chinook Salmon and Steelhead	Increase the operational flexibility to allow for decreases in water temperatures downstream of the Thermalito Afterbay Outlet to encourage gravel utilization downstream of Thermalito Afterbay Outlet.	X	X		X		X		X		See also EWG 36 & EWG-37.	Mike Meinz, David Olson, Modeling Group (Carl Chen & Eric Brandstetter)	TBD
EWG-20	High Flow Channel	Fish Spawning and Habitat	Woody Debris Recruitment for Juvenile Fish Rearing Habitat	Add woody debris in the Feather River. Large woody debris would be anchored or inserted into the river at target locations to provide increased habitat complexity. (FR-23, FR-4)			X	X	X	X		X	Characterize current instream woody debris quantity and distribution: SP-F3.2 Task 4 SP-G2	This Resource Action would provide the related benefit of increasing organic inputs. Additional information on the viability and sustainability of LWD placement in the Feather River flow regime and identification of candidate sites is required. Related to EWG-13. Higher complexity LWD generally provides relatively high quality juvenile rearing habitat value, but generally has a shorter longevity than low complexity LWD. Use Fluvial 12 Model to assess geomorphic effects of woody debris placement.	TBD	TBD
EWG-21	High Flow Channel	Fish Rearing Habitat Enhancement	Rearing Habitat for Juvenile Salmonids	Increase quantity of shallow water rearing habitat for juvenile salmonids in the high flow section of Feather River by releasing higher flows. (FR-24)		X		X	X	X		X	Transect data: SP-F16 and SP-G2; Habitat suitability information for rearing Chinook and steelhead: SP-F16	Related to EWG-16A and EWG-16B. Increasing flows may or may not provide additional shallow water habitat depending upon the shape of the channel. Increased flows may result in loss of suitable habitat with respect to velocities. SP-F16 may provide information describing the relationship between flow and availability of Chinook and steelhead juvenile rearing habitat.	Mike Meinz, David Olson, Tom Payne	23-Jul-03
EWG-22	High Flow Channel	Fish Rearing Habitat Enhancement	Increase Rearing Habitat for Juvenile Fish Species	Increase connectivity between river channel and floodplain habitats (including low-elevation terraces) in lower Feather River by setting back levees to create seasonal habitats for Chinook salmon, splittail, and steelhead. (FR-25)		X	X	X	X	X		X	SP-G2	Ongoing studies associated with SP-G2 will provide additional data. Related to EWG-21, EWG-23, EWG-25, & EWG-36. Repositioning levees may affect flood control.	TBD	23-Jul-03
EWG-23	High Flow Channel	Fish Rearing Habitat Enhancement	Rearing Habitat for Juvenile Steelhead and Chinook	Provide higher and longer duration flows in winter/spring. Provide flow in the high flow channel to inundate floodplains to provide high quality rearing habitat. This Resource Action would provide higher flows, which would increase quantity of fish (splittail and Chinook) rearing habitat. (FR-26)		X			X	X		X		Ongoing studies associated with SP-G2 will provide additional data. Related to EWG-21, EWG-22, EWG-25, & EWG-36. [Note: Not sufficiently detailed or well-developed to distinguish from EWG-21 and EWG-25.]	TBD	23-Jul-03
EWG-24	High Flow Channel	Fish Rearing Habitat Enhancement	Rearing Habitat for Juvenile Chinook and Splittail	Construct or create permanent juvenile fish nursery areas for steelhead and Chinook on existing State owned lands or on newly purchased areas. (FR-27)								X		More information needed on potential sizes and areas for land acquisition. Also need to study or determine the potential geomorphic effects of channel and floodplain changes.	TBD	TBD
EWG-25	High Flow Channel	Fish Rearing Habitat Enhancement	Rearing Habitat for Juvenile Salmonids and Splittail	Use flow releases from the Thermalito Afterbay Outlet to provide additional floodplain habitats adjacent to the river channel. (FR-28)		X			X	X				Unclear how much increased flow is needed to inundate areas. Could be combined with EWG-21, EWG-23, & EWG-36. Note: Not sufficiently detailed or well-developed to distinguish from EWG-21 and EWG-23.	TBD	TBD

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Preliminary: For Environmental Work Group Discussion Only					Temperature Related	Flow/Water Level Related	Construction/Heavy Equipment	O&M	Permitting	Cross-Resource/Area Effect	Nexus to the Project Operations (see note)	Need Additional Info	Information Pending [Studies Being Conducted]	Comments and Additional Information	Technical Contacts/ Resource Team	Date for Narrative Report
Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
EWG-26	Thermalito Afterbay	Fish Habitat Enhancement	Habitat Complexity for Warmwater Species	Provide habitat enhancement in areas without weeds, primarily through added structure, for warmwater or other target species (i.e. black bass). (TC-4)			X		X			X		Need specifics on habitat enhancement (may be similar to EWG-31).	TBD	TBD
EWG-28	Thermalito Afterbay	Fish Rearing Habitat Enhancement	Bass Nest Survival	Manage water levels in the Thermalito Afterbay to provide increased nesting and initial rearing habitat for nesting warmwater species. (TC-6)		X		X		X		X	Characterization of inundated littoral habitat and evaluation of the effects of fluctuations on bass nest dewatering: SP-F3.1 Task 4C	There are operational constraints, however, to Thermalito Afterbay water level fluctuations. Need reservoir level and spawning relationship info. Limits operational flexibility. This Resource Action would be most effective in the spring & fall. Potential cross-resource impacts on waterfowl nesting. Additional data is forthcoming.	TBD	TBD
EWG-29	Oroville Wildlife Area	Fish Habitat Enhancement	Aquatic Weed Control	Control aquatic weeds to enhance fish habitat in the OWA ponds. Aquatic weed control could be accomplished using various methods, including but not limited to mechanical control, chemicals, or altering the flows. (TC-11, TC-3)		X		X	X	X		X	Characterize fish habitat in one-mile pond: SP-F3.1 Task 5B	Additional Resource Action impacts would be Terrestrial & Recreational.	TBD	TBD
EWG-98	Thermalito Afterbay	Fish Rearing Habitat Enhancement	Nursery Habitat Enhancement	Use brood ponds as nursery habitat for warmwater species (i.e. black bass) in the Thermalito Afterbay.				X		X				After rearing in brood ponds, fish could be seined out and placed in the Thermalito (Complex or Afterbay). This may be a Recreation issue. Potential concerns could be predation on ducklings and amphibious species.	TBD	TBD
EWG-30	Lake Oroville	Protect Nesting Habitat	Bass Nest Survival	Regulate reservoir drawdowns to less than 9 ft/month to reduce bass nest dewatering and subsequent mortality. (LO-1)		X		X		X			Evaluation of Lake Oroville water surface elevation reductions on bass nest dewatering: SP-F3.1 Task 2C.	This Resource Action would be implemented from March to June. Study Plan, SP-F3.1 Task 2C, indicates that under current operating parameters, bass nest survival exceeds the 20% criteria of DFG in all months from March-June. (If implemented, guidance would be to limit potential drawdown rates to less than 9 ft/month.)	TBD	TBD
EWG-31	Lake Oroville	Fish Habitat Enhancement	Bass Habitat Enhancement	Develop/modify habitat enhancement program for fish rearing/refuge in Lake Oroville through the placement of woody debris, Christmas tree reefs, or other, yet to be determined, methods. This Resource Action could include enhancement of spawning and nesting shelters for resident fish (bass and catfish) in the shallow areas of Lake Oroville. Habitat enhancement may incorporate the addition of riprap, concrete, or weighted pipes, or by adding artificial reefs in the shallow areas of Lake Oroville. This Resource Action is related to drawdown because selecting areas for habitat improvement will need to take into account seasonal fluctuations of the reservoir.(LO-4)		X	X	X	X	X				Similar program has been conducted in recent years. Need info on depths of implementation and habitat needs.	TBD	TBD
Aquatic Resources - Provide Nutrients from Anadromous Fish to Support Desired Ecological Function																

					Resource Action Information											
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Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
EWG-32	Upstream Tributaries	Salmonid Nutrient Enhancement	Nutrient Supplementation For Salmonids	This Resource Action would supplement tributaries to Lake Oroville with salmon carcasses or carcass analogs (chemicals) to increase levels of marine-derived nutrients (assuming nutrient supplementation is desired). (LO-8)				X	X	X			SP-W1 & SP-F8	Nutrient sampling as part of SP-W1 will provide baseline condition data. Related to removing fish passage barriers in upstream tributaries to enhance nutrient cycling. Could have cross-resource impact with riparian vegetation at supplementation sites from increased nutrient loading. If carcasses used, timing of supplementation likely late-winter/early spring, but depends on carcass availability. Potential issues would include water quality, fish disease, public health concerns, and potential effects on recreation.	TBD	TBD
EWG-33	Upstream Tributaries	Salmonid Nutrient Enhancement	Nutrient Supplementation For Salmonids	Provide resident salmonids with access to the upstream tributaries by removing sediment plugs, boulders, and manmade barriers. This Resource Action could include the removal of Big Bend Dam or the construction/repair of fish passage facilities at this site to open up the Poe Reach. (LO-5, LO-6, LO-7)		X	X	X	X	X		X	-SP-F8; -SP-F3.1-Task 1A-Identify and characterize upstream migration barriers; -SP-F3.1-Task 1B-Fish composition in upstream tributaries; -SP-F3.1-Task 2A-Fish composition in Lake Oroville; -SP-F5/7-Interactions of Lake Oroville fish with tributary fish (Task 3).	Fish would migrate up from Lake Oroville, die, and as they decay, nutrients would be introduced to the waters in the upstream tributaries. This Resource Action is essentially the same as EWG-10. This could also potentially benefit planted Coho salmon. Removal of Big Bend Dam would need to be assessed for geomorphic effects.	TBD	TBD
Aquatic Resources - Reduce Predation on Salmonids and other Native Aquatic Species																
EWG-27	Low Flow Channel	Fish Predation	Rearing Habitat for Juvenile Fish Species	Fill or reclaim Robinson Riffle Borrow pond (used for gravel extraction) to reduce predator habitat. (TC-5)			X		X			X	SP-G2	Could result in increases in water temperatures because of increased surface area. Potential contaminant concerns (i.e. mercury). Need specifics on amount of habitat that would be reclaimed and which fish species use the pond. Use Fluvial 12 to assess future effects on channel stability.	TBD	TBD
EWG-34	Low Flow Channel	Fish Predation	Predation on Juvenile Fish Species	Exclusionary devices (e.g., weirs) placed at the lower part of the low flow section would have a potential benefit of reducing predation on salmonids in the low flow section of the Feather River. (FR-14)		X	X	X	X	X				Extent of effect of predation on juvenile salmonids is unquantified Sacramento pikeminnow most common native predator. Resource Action could impact navigation/boating. Could be combined with EWG-2 & EWG 41.	TBD	23-Jul-03
EWG-35	High Flow Channel	Fish Predation	Predation on Juvenile Fish Species	Lower existing water temperatures at the Thermalito Afterbay Outlet for the purpose of reducing feeding rates for predators in the Feather River. (TC-9)	X	X		X	X	X			Water Temp Modeling Study & SP-F21	Data needed on impact of cooler flows to Feather River biotic resources. (Cooler water may result in slower growth for salmonids.) Unclear to what extent colder releases from the Thermalito Afterbay could lower Feather River water temperatures. Extent of effect of predation on juvenile salmonids is unquantified. Related to EWG-37 and EWG-83. The use of water temperature as a mechanism to exclude predators from the LFC could also be discussed. Need to find out what time of year would this take place and by how much would water temperatures be lowered.	David Olson, Chuck Hanson, Modeling Group (Carl Chen & Eric Brandstetter)	23-Jul-03

					Resource Action Information											
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Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
EWG-42	High Flow Channel	Fish Predation	Feather River Fish Hatchery Practices	Release hatchery steelhead at a smaller size or alter release timing so predators are not conditioned to releases--(FR-30)						X		X	SP-F9 SP-F21	Requires coordination with Cal F&G. This Resource Action was moved from previous location because it deals specifically with predation.	TBD	TBD
Aquatic Resources - Provide Desirable Water Temperatures for Cold Water Fish Species																
EWG-36	Low Flow Channel	Water Temperature	Immigration, Spawning, and/or Rearing Habitat Enhancement for Chinook Salmon and Steelhead	Operate the Oroville Facilities in a manner which would provide additional cold water in the low flow channel of the Feather River for benefit of Chinook salmon and steelhead. (TC-7)	X	X		X	X	X			-Water Temp. on pre-spawning adults: SP-F10 Task 1D -Water Temp. on holding habitat: SP-F10 Task 1E -Water Temp on Spawning and Incubation: SP-F10 Task 2C -Water Temp on Juvenile Rearing: SP-F10 Task 3B -Water Temp on Emigration: SP-F10 Task 4B	Uncertain how much cooler water would be needed from Lake Oroville to affect water temperatures in the Feather River. Will get info from modeling efforts.	TBD	23-Jul-03
EWG-37	High Flow Channel	Water Temperature	Immigration, Spawning, and/or Rearing Habitat Enhancement for Chinook Salmon and Steelhead	Operate the Oroville Facilities in a manner which would provide additional cold water in the low flow channel of the Feather River for benefit of Chinook salmon and steelhead. (TC-7)	X	X		X	X	X			-Water Temp. on pre-spawning adults: SP-F10 Task 1D -Water Temp on Spawning and Incubation: SP-F10 Task 2C -Water Temp on Juvenile Rearing: SP-F10 Task 3B -Water Temp on Emigration: SP-F10 Task 4B	Uncertain how much cooler water would be needed from Thermalito Complex that could affect water temperatures in the Feather River. Will get info from modeling efforts. Related to EWG-35 and EWG-83.	TBD	23-Jul-03
EWG-38	Lake Oroville	Water Temperature	Increase Habitat Quantity for Coldwater Species	Manage withdrawals from Lake Oroville to minimize reduction of coldwater pool. (LO-3)		X		X		X		X	Water Temp Modeling Study & SP-F3.1, Task 2B	Ongoing studies indicate that under current operating parameters, sufficient coldwater is available to support salmonids stocking goals. Related to EWG-51. Will get info on coldwater pool from modeling efforts.	TBD	TBD
Aquatic Resources - Minimize Hatchery Impacts on Anadromous Salmonids and Resident Fish																
EWG-39	Feather River Basin	Fish Disease Concerns	Feather River Fish Hatchery Practices	Within the Fisheries Management Plan, develop an analytical process for evaluating fish disease. (FR-11, FR-30, TC-11, LO-2)	X				X	X		X	SP-F2 & SP-F 5/7	This Resource Action combines the previous EWG-39, along with EWG-43, EWG-46, & EWG-49. To be further developed.	TBD	TBD
EWG-40	Low Flow Channel	Fish Spawning Habitat Enhancement	Over-Escapement Related to Hatchery Production	Decrease hatchery production of salmon so that there is less crowding and competition for limited spawning habitat in the low flow section of the Feather River. (FR-12, FR-31)						X			Redd superimposition SP-F10 Task 2B SP-F9	Requires coordination with Cal F&G.	TBD	TBD

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Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
EWG-41	Low Flow Channel	Fish Hybridization	Maintain the Genetic Integrity of Spring-Run and Fall-Run Chinook Salmon	Use a weir to monitor and restrict access of returning adult Chinook salmon to the low flow section of the Feather River. This Resource Action potentially would reduce genetic introgression between Chinook races and between hatchery/wild salmonids. This Resource Action also would potentially reduce crowding and competition for limited spawning habitat. (FR-13) (FR-32)			X	X	X					Could be combined with EWG-2 & EWG-34.	TBD	23-Jul-03
EWG-44	Thermalito Complex	Fish Disease Concerns	Stocked Fish Diseases	Evaluate current rainbow trout stocking program in Forebay to look at angler preferences and to prevent the spread of fish diseases (<i>C. shasta</i> or <i>IHN</i>). Screen all stocked fish for fish diseases. Potentially cease fish planting in Thermalito Forebay to prevent disease transmission to fishes in the Feather River. (TC-8)				X		X			SP-F9	Related to EWG-11. Indications are that the rainbow trout contract <i>C. shasta</i> and die within two weeks.	TBD	TBD
EWG-45	Thermalito Forebay	Recreational Fishery Enhancement	Recreational Fishery	Create trophy salmonid stocking program in Afterbay similar to trophy program in Lake Oroville. (TC-10).				X	X	X				Possible conflict due to interactions between salmonids in Feather River (see EWG-44). Requires coordination with Cal F&G. Cold water needs in Afterbay for stocked fish could impact rice farmer needs. Also could implement program in Thermalito Diversion Pool.	TBD	TBD
EWG-47	Oroville Wildlife Area	Recreational Fishery Enhancement	Increase Fish Production	Create trout stocking program in suitable OWA ponds. Program would operate seasonally and all stocked fish would be screened for disease. (TC-12)				X	X			X	Characterize Fish Habitat in Oroville Pond: SP-F3.2 Task 5B	Stocked fish have potential to interact with the fish in the Feather River. A stocking program could be combined with EWG-48. Disease screening won't do any good if the fish don't contract the disease until they are planted.	TBD	TBD
EWG-48	Oroville Wildlife Area	Recreational Fishery Enhancement	Increase Production for Recreational Fishery	Stock warmwater species (e.g., Florida strain bass) in selected OWA ponds to create trophy angling areas. (TC-13)	X			X	X			X	Characterize Fish Habitat in Oroville Pond: SP-F3.2 Task 5B	A potential concern would be that stocked fish have potential to interact with the fish in the Feather River. A stocking program could be combined with EWG-47	TBD	TBD
EWG-50	Lake Oroville	Recreational Fishery Enhancement	Increase Fish Production	Develop cold water fishery in Lake Oroville. This Resource Action would involve developing management protocols for the coldwater fishery upstream of Lake Oroville as well as in the reservoir. (LO-3)	X			X	X			X		This would be designed to further develop the existing coldwater fishery. (A coldwater fishery already exists in Lake Oroville.)	TBD	TBD
Terrestrial Resources - Enhance and Protect Terrestrial and Riparian Habitat for Native Plant and Animal Species																
EWG-51	Low Flow Channel	Riparian Habitat Enhancement	Enhance Riparian Vegetation for Increased Shading and Habitat Complexity	Enhance riparian vegetation and trees along banks for shading and increased habitat complexity. (FR-35)		X		X	X	X		X	TBD - Assess channel stability and bank erosion from SP-G2	The first step in this process would be to identify which areas would be addressed, and what plant and tree species would be used. One location for vegetation enhancement could be trailer park riffle along east side, although high-water events may require continued maintenance/improvement. Future erosion of vegetated banks and point bar development could come from Fluvial 12 Model results.	Richard Harris, Koll Buer, Gail Kuenster, Sharon Stohrer	23-Jul-03

					Resource Action Information											
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Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
EWG-52	Low Flow Channel	Terrestrial Species Protection	Minimize Recreational Impacts on Terrestrial Species	Modify recreational use patterns in Feather River to minimize impacts to important terrestrial species (FR-36, FR-40)				X		X			SP-T2 & SP-T9	Exact measures dependent on analysis in upcoming report. Need to identify which species would be impacted (vernal pool species, VELB, plus additional species of concern). Changes might include: closures, modification of boat speeds, angling access, or ORV restrictions. A map defining the area would be helpful to better flush out suggested changes. Need to determine which agency would be responsible for the various reaches (DWR, F&G, and National Parks). Could be combined with EWG-54 & EWG-59.	TBD	TBD
EWG-53	High Flow Channel	Wildlife Habitat Enhancement	Increase Vegetative Cover	Provide improved vegetation cover and improved recreational screening within important migration corridors. (FR-41)		X		X	X					There would be a need to identify which areas and species would be used. Need to identify which ‘problem’ we are trying to solve with this resource action. To be considered an action within combination EWG-55 & EWG-60.	TBD	TBD
EWG-54	Thermalito Complex	Terrestrial Species Protection	Minimize Terrestrial Impacts from Recreational Use	Modify recreational use patterns in Thermalito Complex to minimize impacts to important terrestrial species (exact measures dependent on analysis in upcoming report) (TC-14)		X		X	X	X			SP-T2 & SP-T9	State Parks is responsible for diversion pool and Forebay; F&G is responsible for Afterbay and OWA. See comments on EWG-52. Could be combined with EWG-52 & EWG-59.	Dave Boegner, Gail Kuenster, MaryLou Keefe, John Cannon, Woody Elliott	23-Jul-03
EWG-55	Thermalito Complex	Wildlife Habitat Enhancement	Provide Additional Vegetative Cover	Provide improved vegetation cover and improved screening within important corridors. (TC-15)		X		X	X					Could be combined with EWG-53 & EWG-60.	TBD	TBD
EWG-56	Thermalito Complex	Waterfowl Habitat Enhancement	Increasing Nesting Habitat	Construct and maintain additional brood ponds to accommodate nesting waterfowl in the Thermalito Afterbay. (TC-16)		X	X	X	X	X		X	SP-T1	Must consider land availability. Response is Afterbay fluctuations.	TBD	TBD
EWG-57A	Thermalito Complex	Waterfowl Habitat Enhancement	Increase Upland Nesting Coverage	Enhance upland cover in the vicinity of the Thermalito Afterbay for the benefit of nesting waterfowl. (TC-17)		X	X	X		X		X	SP-T1	Irrigation of installed upland cover would need to be addressed. [Curtis is investigating this.] Resource Actions could include the use of various species (CDFG seedmix, (wheatgrass/ vetch/barley, etc.) [Initial estimate: \$140 to plow, seed, and fertilize.] Upland cover enhancement can provide higher nesting densities (2-3 nests/acre) for waterfowl than current brood ponds. Plowing upland could be a cross resource issue (loss of native grasslands).	TBD	TBD
EWG-57B	Thermalito Complex	Waterfowl Habitat Enhancement	Increase Forage Cover (and Wetland) Habitat for Migrating Waterfowl	Provide upland cover enhancement in the vicinity of the Thermalito Afterbay for the benefit of migrating waterfowl. (TC-25)					X				SP-T1	Additional information is needed for this PM&E (i.e. John Cannon). This Resource Action was formerly EWG-69.	TBD	TBD
EWG-58	Oroville Wildlife Area	Waterfowl Habitat Enhancement	Increase Habitat for Nesting Waterfowl	Install wood duck nest boxes in the OWA.				X		X			SP-T1 & SP-T9	Nest boxes installed in D-area of OWA to develop duck habitat. Would be done in conjunction with CWA & Ducks Unlimited. DWR would purchase material, and CWA & DU would install boxes.	TBD	TBD
EWG-59	Oroville Wildlife Area	Terrestrial Species Protection	Minimize Terrestrial Impacts from Recreational Use	Modify recreational use patterns in Feather River and OWA reach to minimize impacts to important terrestrial species. (TC-26)				X		X		X	SP-T2 & SP-T9	Species of concern would include VELB. Need to complete species survey. [Exact measures dependent on results of study plan report.] Could be combined with EWG-52 & EWG-54.	Dave Boegner, Gail Kuenster, MaryLou Keefe, John Cannon, Andy Atkinson	23-Jul-03

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EWG-60	Oroville Wildlife Area	Wildlife Habitat Enhancement	Increase Vegetative Cover	Provide improved vegetation cover and screening within important corridors within the OWA. (TC-27)		X		X	X					Could be combined with EWG-53 & EWG-55.	TBD	TBD
EWG-61	Oroville Wildlife Area	Riparian Habitat Enhancement	Increase Riparian Recruitment	Develop a hydrologic flow regime (management protocols) to support natural regeneration of riparian recruitment along the Feather River. (FR-39, TC-28)		X		X		X		X	SP-T3-5 (modeling) SP-G2 (Fluvial 12 model)	This could include establishing a flow regime which would inundate the floodplain, and gradually reduce the water levels in order to allow for the establishment of root systems as well as discourage the establishment of noxious plants. The frequency of the flooding could be on the order of once every 5 to 10 years. Not further defined at this time. Could be combined with EWG-66. E&O modeling is related. Fluvial 12 to be used to establish flow regime required to do Geomorphic work of bank erosion and point bar development.	TBD	23-Jul-03
EWG-62	Lake Oroville	Upland Habitat Enhancement	Restore Native Plant Communities	Implement vegetation or restoration activities to enhance or restore native plant communities in the Lake Oroville upland areas.(LO-9)			X	X	X	X		X	SP-T10 & SP-T11	Potential sites not defined at this time. SP-T10 will identify areas for vegetation restoration. Potential liability issues. State Parks would have an interest here (enhancing natural processes). Remove and revegetate abandoned recreation trails. State Parks is interested a biomass reduction program to reduce potential wildland fires. This may influence the restoration activities.	TBD	TBD
EWG-63	Lake Oroville	Terrestrial Habitat Enhancement	Reduction of Nuisance or Non-Native Wildlife	Retrofit existing Lake Oroville recreational facilities to remove potential food sources, nesting sites, and rodent refuge areas for nuisance or pest species. (LO-10)				X		X		X	SP-T8	Remove nest sites, food sources. There may be some native species impacts (non-nuisance) through implementation of this action.	TBD	TBD
EWG-64	Lake Oroville	Terrestrial Habitat Enhancement	Reduction of Non-Native Wildlife	Implement measures to reduce populations of nuisance non-native wildlife in the Lake Oroville areas. (LO-11)								X	SP-T8	Not further defined at this time. This Resource Action may not be necessary because it is covered by EWG-63. It could remain if it deals with the turkey issue. A literature review (turkeys feeding habits) could be implemented to determine problems & potential solutions.	TBD	TBD
EWG-65	Lake Oroville	Terrestrial Species Protection	Reduce Recreational Impacts on Terrestrial species	Implement measures to reduce recreational disturbances (i.e. trespass & grading) on wildlife populations as needed based on the results of study plan SP-T9. (LO-12)				X		X		X	SP-T2 & SP-T9	Not further defined at this time. Trespass Issues? (A Recreational issue) SP-G1 may also provide erosion data. Actions could include closing trails to protect nesting bald eagles.	TBD	TBD
EWG-66	High Flow Channel	Riparian Habitat Enhancement	Increase Riparian Recruitment	Develop a hydrologic flow regime to support natural regeneration of riparian vegetation along the Feather River. (FR-39, TC-18, TC-28)		X		X		X		X	SP-T3-5 (modeling) SP-G2 (Fluvial 12 model)	Could involve riparian restoration, removing beaver dams (within the OWA) or developing protocols to address enhancement for cottonwood trees and discourage encroachment by noxious weeds. Not further defined at this time. E&O modeling is related. [Flow related For the modeling efforts]. Need to identify areas for active restoration or re-plantings. Could be combined with EWG-61. Fluvial 12 to be used to establish flow regime required to do Geomorphic work of bank erosion and point bar development.	TBD	TBD
EWG-67	Thermalito Complex	Riparian Habitat Enhancement	Increase Wetland Development	Initiate active vegetation plantings in Thermalito Afterbay area. (TC-19)				X	X			X	SP-T 3-5 & SP-T7	This resource action would also be useful for the OWA. This action would also be triggered to compensate for non-native species removal (revegetate areas that have been remove).	TBD	TBD
EWG-68A (formerly EWG-68)	Thermalito Complex	Waterfowl Habitat Enhancement	Maintain or Enhance Brood Ponds	Recharge brood ponds at 3-week intervals for the brooding periods (March 15 to June 15). (TC-20)		X		X		X		X	SP-T1	Limits operational flexibility at Thermalito Complex. This action would be especially useful in dry years.	TBD	TBD
EWG-68B (formerly EWG-64A)	Lake Oroville	Riparian Habitat Enhancement	Enhance Bass Shoreline Habitat	Build or enhance riparian habitat in the fluctuation zone of Lake Oroville Reservoir.		X		X	X	X			SP-T3-5	Could provide recreational fishing benefits.	TBD	TBD

					Resource Action Information											
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Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
Terrestrial Resources - Control the Dispersal of Non-Native/Undesirable Plant Species																
EWG-70	Low Flow Channel	Non-Native Plant Control	Eliminate Noxious Plants	Eliminate noxious plants via biological control, herbicidal treatment or mechanical control and replant with native species. (FR-37, FR-42, TC-21, TC-29)				X	X	X			SP-T7	May require continued maintenance due to periodic high-flow events or evaluation of appropriate technique. Could be combined with EWG-74A.	TBD	TBD
EWG-73	Thermalito Complex	Non-Native Plant Control	Eliminate Noxious Plants	Control non-native and undesirable plant species (e.g., purple loose-strife) in the Thermalito Complex. (TC-23)					X			X	SP-T7	Further information in needed on the life history traits and distribution of non-native and undesirable plant species in the area.	Gail Kuenster, John Cannon, Dave Stevens, Andy Atkinson	23-Jul-03
EWG-74A (formerly EWG-74)	Oroville Wildlife Area	Non-Native Plant Control	Eliminate Noxious Plants	Eliminate noxious plants via biological control, herbicidal treatment or mechanical control and replant with native species. (FR-37, FR-42, TC-21, TC-29)				X	X	X		X	SP-T7	May require continued maintenance due to periodic high-flow events or evaluation of appropriate technique. Could be combined with EWG-70.	Gail Kuenster, John Cannon, Dave Stevens, Woody Elliott	23-Jul-03
EWG-74B (formerly EWG-74A)	Lake Oroville	Non-Native Plant Control	Eliminate Noxious Plants	Eliminate noxious plants via biological control, herbicidal treatment or mechanical control and replant with native species.. (FR-37, FR-42, TC-21, TC-29)				X	X	X		X	SP-T7	May require continued maintenance due to periodic high-flow events or evaluation of appropriate technique. Could be combined with EWG-69.	TBD	23-Jul-03
EWG-75	Oroville Wildlife Area	Non-Native Plant Control	Eliminate Noxious Plants	Develop construction and recreational management protocols to control the spread of noxious species. These could include weed control/removal and/or replanting with native species, or (FR-44, TC-22, TC-30)						X			SP-T7	This Resource Action would address dispersal of primrose. Could be combined with EWG-78 & EWG-80.	TBD	TBD
EWG-76	Oroville Wildlife Area	Non-Native Plant Control	Eliminate Noxious Plants	Develop a variety of control measures, including hydrologic regime, to support and protect native riparian vegetation in the Oroville Wildlife Area. (TC-31)		X		X		X		X	SP-T7	This Resource Action would incorporate life history traits and distribution of native and non-native species from ongoing studies, in addition to information on groundwater and surface water supply in the vicinity of the OWA. Not further defined at this time. Could involve deepening ponds so they do not dry up. Need to focus on primrose using a variety of control measures.	TBD	TBD
Terrestrial Resources - Protect and Enhance Populations of T&E Plant and Animal Species																
EWG-77	Low Flow Channel	Riparian Habitat Enhancement	Habitat Enhancement for Threatened & Endangered Species	Enhance or add riparian habitat for threatened and endangered species in the low flow section of the Feather River. (FR-38)					X	X		X		Fluvial 12 to be used to assess future bank erosion and channel migration associated with different flow regimes. At this time, this Resource Action is not specific to locations within the low flow section of the Feather River or species that would be involved in riparian enhancement (may require continued maintenance due to periodic high-flow events). The addition of riparian habitat may require land acquisition. Need to identify T&E species. Could be combined with EWG-79.	TBD	TBD
EWG-78A	Thermalito Complex	Riparian Habitat Enhancement	Habitat Enhancement for Special Status Species	Develop maintenance and recreational management protocols to avoid impact to special status species within the project area. (FR-45, TC-24)								X	SP-T2 & SP-T9	Specific measures associated with this Resource Action are not identified at this time (added 5/7/2003). Could be combined with EWG-80.	TBD	TBD
EWG-78B	High Flow Channel	Protection of Riparian Habitat	Habitat Protection for Special Status Species	Develop maintenance and recreational management protocols to avoid impact to special status species within the project area. Specific measures associated with this Resource Action are not identified at this time. (FR-45, TC-24)								X	SP-T2 & SP-T9	Could be combined with EWG-80.	TBD	TBD
EWG-79	Oroville Wildlife Area	Riparian Habitat Enhancement	Habitat Enhancement for Threatened & Endangered Species	Enhance riparian habitat for threatened and endangered species in the OWA. (FR-38, TC-32)				X	X	X		X	SP-T2 & SP-T4	Some areas could require continued maintenance due to periodic high-flow events. At this time, this Resource Action is not specific to locations within the OWA. Could be combined with EWG-77.	TBD	TBD

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Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
EWG-80	Oroville Wildlife Area	Riparian Habitat Enhancement	Habitat Protection for Special Status Species	Develop maintenance and recreational management protocols to avoid impact to special status species within the project area. (FR-45, TC-24, TC-33)								X	SP-T2 & SP-T9	Specific measures associated with this Resource Action are not identified at this time. Could be combined with EWG-78.	TBD	TBD
EWG-81	Lake Oroville	Riparian Habitat Enhancement	Habitat Protection for Nesting Species	Develop disturbance avoidance plans in the vicinity of nest sites during the nesting season of bald eagles and peregrine falcons. (LO 13)								X		Not further defined at this time.	TBD	TBD
EWG-82	Lake Oroville	Riparian Habitat Enhancement	Habitat Protection for Sensitive Plant Species	Develop protection and avoidance protocols for sensitive plant populations in the Lake Oroville Area. (LO-14)								X		Not further defined at this time. Could be combined with similar Resource Actions above.	TBD	TBD
Water Quality -- Maintain and Protect Water Quality for All Beneficial Uses																
EWG-83	High Flow Channel	Fish Habitat Enhancement	Improve Water Temperature for Salmonids	Operate the Thermalito Complex to provide colder water to Lower Feather River for the benefit of salmonids. (EWG-35). (FR-46) (TC-7)	X	X			X	X			Water Temp Modeling Study	Related to EWG-35. This would improve habitat for rearing juvenile and pre-spawning adults.	David Olson, Sharon Stohrer, Modeling Group (Carl Chen & Eric Brandstetter)	23-Jul-03
EWG-84	Low Flow Channel	Water Quality	Improve Water Quality	The settling ponds associated with the Feather River Fish Hatchery are designed to hold effluent until evaporation occurs, but there is high connectivity between the ponds and the Feather River. Leaching occurs from the settling ponds to the Feather River. The ponds’ gravel bottom provides some unknown level of filtration. This Resource Action would construct new settling ponds at the existing location or in a different area that would prevent leaching and/or enhance evaporation. (FR-47)				X	X	X		X		May reduce flow in 'Hatchery Ditch', which is heavily used Chinook salmon and steelhead spawning area. Could be combined with EWG-85.	TBD	TBD
EWG-85	Low Flow Channel	Water Quality	Improve Water Quality	Line existing holding pond with impermeable barrier to prevent leaching (FR-48)				X	X			X		May reduce flow in 'Hatchery Ditch', which is heavily used Chinook salmon and steelhead spawning area.	TBD	TBD
EWG-86	Low Flow Channel	Water Quality	Improve Water Quality	Assuming further toxic screening indicates problems, post “no swim” or “don’t eat fish” warnings anywhere that tissue and/or sediment results suggest problems may be present. (FR-49)										Additional geographic areas would also be evaluated.	TBD	TBD
EWG-87	Thermalito Complex	Water Temperature	Improve Water Temperature for Salmonids	Operate or modify the Oroville Complex in a manner to provide suitable warm water for agricultural purposes, while providing adequate cold water releases at the Thermalito Afterbay Outlet. (FR-46)	X	X			X	X		X	SP-W6	Possible conflict with effects of EWG-83 on temperature for salmonids.	TBD	23-Jul-03
Fluvial Processes - Maintain and Enhance Aquatic Habitat																
EWG-88 (moved to fishery section)	Low Flow Channel	Fish Spawning Habitat Enhancement	Spawning Gravel Quantity	Increase flows in the low-flow reach of the Feather River reach to increase available spawning habitat. This Resource Action would increase flows above current levels (600 cfs) during peak Chinook spawning to increase the quantity of habitat available for salmonids. (FR-51)	X	X		X	X	X		X	SP-F16 SP-G2	This Resource Action would need to keep flows up during periods of fish spawning so as to not dewater redds. Ongoing field analysis associated with SP-G2 will provide additional data. Essentially the same Resource Action as EWG-15. SP-F16 will determine the flow range at which weighted usable area (WUA) is greatest.	TBD	TBD
EWG-89	Low Flow Channel	Fish Spawning Habitat Enhancement	Spawning Gravel Habitat	Create levee setbacks to increase meandering nature of river and improve gravel composition in critical spawning reaches of the low flow reach (FR-52)		X		X				X	SP-G2	Ongoing field analysis associated with SP-G2 will provide additional data. Use Fluvial 12 Model to assess future channel migration.	Phil Unger, David Olson, Steve Rothert, & Modeling Group (Carl Chen & Eric Brandstetter)	23-Jul-03

					Resource Action Information											
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Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
EWG-90 (moved to fishery section)	Low Flow Channel	Fish Spawning Habitat Enhancement	Spawning Gravel Quantity	Rip sections of the low-flow reach to improve spawning gravel composition for Chinook salmon and steelhead. This Resource Action is not specific to location at this time; results from ongoing geomorphology studies (SP-G2) will be used to better define ripping and target locations in the low-flow reach. (FR-53)			X	X	X	X		X	SP-F10.2A-gravel quality and armoring SP-G2	Ongoing field analysis associated with SP-G2 will provide additional data. May impact water quality in the Feather River. Related to EWG-18. Use Fluvial 12 Model to assess river substrate effects.	TBD	23-Jul-03
EWG-91 (moved to fishery section)	Low Flow Channel	Fish Spawning Habitat Enhancement	Spawning Gravel Quantity	Supplement the low-flow reach with suitable spawning gravel to increase productivity (i.e., # fish produced per unit area). (FR-50)			X	X	X	X		X	SP-F10.2A-gravel quality and armoring SP-G2	This option likely would require continued gravel supplementation over time. Gravel could be obtained from OWA. Ongoing field analysis associated with SP-G2 will provide additional data. Related to EWG 92. Use Fluvial 12 Model to asses gravel size ranges and future stability.	TBD	23-Jul-03
EWG-92 (moved to fishery section)	Low Flow Channel	Fish Spawning Habitat Enhancement	Spawning Gravel Quantity	Gravel replacement on the lower reach spawning riffles if these areas are found to be of poor spawning quality (ongoing, SP-G2). (FR-55)			X	X	X	X		X	SP-F10.2A-gravel quality and armoring SP-G2	Ongoing field analysis associated with SP-G2 will provide additional data. Related to EWG-91.	TBD	23-Jul-03
EWG-93	Low Flow Channel	Fish Habitat Enhancement	Hydraulic Characteristics of Channel Configuration	Mechanical or hydraulic changes to areas in the low flow reach have been suggested to improve fish habitat. This Resource Action could include several options, such as leveling off selected gravel bars so they are inundated at particular flows, dig side-channels that provide suitable velocity and cover for juvenile fishes, and reconfiguring selected sections of the stream channel to establish additional inundated benches to provide suitable splittail spawning habitat. (FR-54)		X	X		X	X		X	SP-G2	Needs to be further developed. Fluvial 12 model could be used to assess the long term viability of channel changes. A point of discussion for the collaborative would be the relative merits of the two philosophies for river rehabilitation. One is to provide the river with suitable raw materials such as woody debris, sediment including spawning gravel, and suitable flows to allow for geomorphic processes to occur, and then allow the river to establish a new dynamic equilibrium that would be closer to a 'natural' system. This philosophy is being utilized on the Trinity, the Colorado, and to some extent on the upper lower Sacramento. The other philosophy is to extensively and intensively create new channels, construct spawning riffles, holding pools, habitat enhancements, and revegetate riparian areas to approximate a 'natural' system. This philosophy is being used on Lower Clear Creek. There is a need for the collaborative to discuss, and agree upon, a strategy and a philosophy that the Oroville relicensing efforts will pursuing.	TBD	TBD
EWG-94	Oroville Wildlife Area	Fish Habitat Enhancement	Hydraulic Characteristics of Channel Configuration	Increase floodplain connectivity between OWA and mainstream Feather River with the goal of increasing inflow to selected OWA ponds during higher flows. (TC-34)		X	X	X	X	X		X	SP-G2	Related to EWG-22 & EWG-95.	TBD	TBD
Fluvial Processes - Minimize Project Impacts on Erosion and Sedimentation																
EWG-95	Lake Oroville	Impaired Fish Passage	Erosion	Stabilize target stream and reservoir banks to prevent mass wasting. The appropriate bank stabilization method is unknown at this time. (LO-15)			X		X			X	SP-G1		TBD	TBD
EWG-96	Upstream Tributaries	Impaired Fish Passage	Erosion	Stabilize hillslope near Black Canyon and remove sediment barrier. Related to fish passage Resource Actions associated with sediment plugs. (LO-16)		X	X	X	X	X		X	SP-G1	Related to EWG-10.	TBD	TBD
Proposed Resource Actions Eliminated From Further Analysis																
EWG-6	High Flow Channel	Impaired Fish Passage	Impaired Fish Passage	Re-condition the existing benches along the lower Feather River reach to improve fisheries habitat. (FR-18)			X		X	X		X		This Resource Action is to be considered for removal, as it is the same as EWG-19A.		

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Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
EWG-7	High Flow Channel	Impaired Fish Passage	Adult sturgeon fish performance metrics	Assist in field calibration of sturgeon passage information from University California-Davis studies (conducted in lab in 2003). (FR-19)		X		X						Not a PM&E. Assist in field calibration of sturgeon passage information from University California-Davis studies (conducted in lab in 2003)		
EWG-8	High Flow Channel	Impaired Fish Passage	Adult sturgeon upstream passage	Conduct field-tracking studies to determine timing and movement patterns of sturgeon in Feather River (i.e., field-verify whether sturgeon can migrate past Sunset pumps and Shanghai Bench (FR-20)				X				X	SP-F3.2 Task 3A is doing this if we catch any sturgeon	Not a PM&E. Conduct radio field-tracking studies to determine timing and movement patterns of sturgeon in Feather River (i.e., field-verify whether sturgeon can migrate past Sunset pumps and Shanghai Bench (FR-20)		
EWG-9	High Flow Channel	Impaired Fish Passage	Provide Increase Flows for Fish Passage Past Barriers	Provide increase flows to allow fish passage over barriers in lower Feather River. (FR-21)		X			X	X		X	SP-F3.2 Task 3A SP-F10 Task 1C SP-F10 Task 1A	These additional flows would help to provide passage beyond Sunset Pumps and Shanghai Bench. [Flows in the Yuba River also effect passage at Sunset Pumps.] Passage would be most beneficial for sturgeon, shad and Chinook (under low flow/dry year conditions). This Resource Action differs from EWG-4 in that EWG-9 provides flows to allow for passage, while EWG-4 provides attraction flows encourage migration. Also related to EWG-5. [This PM&E has been incorporated in to EWG4A.]		
EWG-12	High Flow Channel	Impaired Fish Passage	Passage of Stocked Rainbow Trout Into Feather River	Install a fish-counting and identification device at the Thermalito Afterbay Outlet and Diversion Dam. (TC-2)		X	X	X	X			X		Not a PM&E. Could be combined with EWG-11.		
EWG-39 (PM&E was moved to Aquatic Resources Section)	Low Flow Channel	Fish Disease Concerns	Feather River Fish Hatchery Practices	Evaluate all proposed management actions for relevance to fish disease concerns. (FR-11, FR-30, TC-11, LO-2)	X				X				SP-F2 & SP-F 5/7	Made back into a PM&E. Was combined with EWG-43, EWG-46, & EWG 49 and moved back to Aquatic Resources Section.		
EWG-43	High Flow Channel	Fish Disease Concerns	Salmon Survival Related to Feather River Fish Hatchery Practices	Evaluate all proposed management actions for relevance to fish disease concerns. (FR-11, FR-30, TC-11, LO-2)	X				X					Combined with EWG-39.		
EWG-46	Thermalito Complex	Fish Disease Concerns	Feather River Fish Hatchery Practices	Evaluate all proposed management actions for relevance to fish disease concerns. (FR-11, FR-30, TC-11, LO-2)	X				X				SP-F2	Combined with EWG-39.		
EWG-49	Lake Oroville	Fish Disease Concerns	Feather River Fish Hatchery Practices	Evaluate all proposed management actions for relevance to fish disease concerns. (FR-11, FR-30, TC-11, LO-2)	X				X				SP-F2	Combined with EWG-39.		
EWG-71	High Flow Channel	Non-Native Plant Control	Proliferation of Non-Native Plants	Develop flow regime to control establishment of noxious species below the Thermalito Afterbay Outlet (FR-43)		X			X	X			SP-T7	This resource action will not be further evaluated because flow control measures would not control non-native plant species in the high-flow area. Other methods would be employed to control non-native plant species. This could include weed control and restoration similar to those mentioned in EWG-70 (but not flow modifications). Related to EWG-61 and EWG-66.		
EWG-72	High Flow Channel	Non-Native Plant Control	Proliferation of Non-Native Plants	Develop construction and recreational management protocols to control the spread of noxious species. (FR-44, TC-22)					X	X				Periodic high flows in the high flow channel are helping to cause the spread of noxious weeds. There does not appear to anything feasible which can be done to control the spread of noxious weeds in the high flow channel. A Resource Action has been suggested to arrest the spread of noxious weeds in the Oroville Wildlife Area (EWG-75).		
Key for "Nexus to Project Operations" Column																

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					Resource Action Information											
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Resource Action Number	Geographic Area	Resource Category	Specific Resource Addressed	Description of Potential Resource Action												
1. Resource Action/Issue is directly affected by the Oroville project facilities. 2. Resource Action/Issue is directly affected by the Oroville project operations. 3. Resource Action/Issue is within the project boundaries. 4. Resource Action/Issue involves third party actions or is the responsibility of another party.																